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Assessment of Industrial Hazardous Waste Practices, Rubber and Plastics Industry. Appendices

Foster D. Snell, Inc., Florham Park, N.J.

Prepared for

Environmental Protection Agency, Washington, D C

Mar 78

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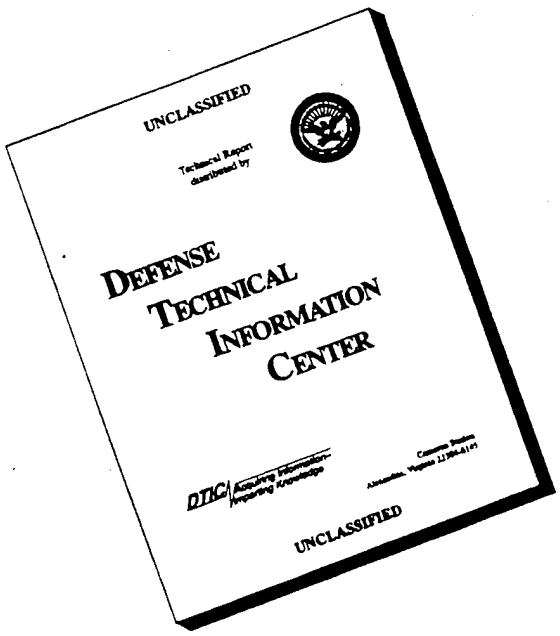

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ASSESSMENT OF INDUSTRIAL HAZARDOUS WASTE PRACTICES,

RUBBER AND PLASTICS INDUSTRY

Appendices

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U.S. ENVIRONMENTAL PROTECTION AGENCY

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16. ABSTRACT

This industry study is one of a series under the Office of Solid Waste Management Program of the Hazardous Waste Management Division, U.S. Environmental Protection Agency. The report concentrates on the rubber and plastics industry. It characterizes these industries in terms of number, location, size and age of plants, products, processes, etc.; identifies and quantifies those wastes which are or may be generated by these industries; describes current practices for treatment and disposal of potentially hazardous wastes; determines the control technologies which might be applied to reduce hazards presented by these wastes upon disposal; and estimates the cost of control technology implementations.

The information presented in the report was acquired from a review of published information; trade association participation; personal contacts; visits to various plants and corporate offices of germane companies; waste sample analysis; and the application of an econometric model to project waste loads for 1977 and 1983.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Control Costs Hazardous Wastes Industrial Wastes Plastics Industry Residues Rubber Industry Sludges Solid Wastes Waste Generation Factors	Chemical Treatment Hazard Potential Incineration Land Filling Lagooning Resin Manufacture Stream Separation Toxicity	

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APPENDIX A -- PROGRAM METHODOLOGY

The approach selected to assess industrial hazardous waste practices in the rubber and plastics industry centered around three major tasks:

- Data collection
- Data analysis and application of economic modeling techniques
- Definition of potentially hazardous waste.

Each of these elements are discussed below. Overall study logic is provided in Exhibit A-1, at the end of the appendix, followed by a task definition in Exhibit A-2.

1. DATA COLLECTION

As noted in Volume I -- Executive Summary, the data requirements for this study were obtained essentially from four sources.

- Review of published information
- Data collected during our previous work for government agencies on the rubber and plastics industry
- Information obtained from trade association participation
- Information obtained from personal contact and visits to the various plants and corporate offices of companies classified in the industry and to waste disposal firms handling hazardous wastes.

Of the above information sources, direct industry contacts proved to be most useful in providing the detailed data requirements. Because almost all facilities visited varied significantly in the manner in which wastes were generated and disposed of, the same questions could not be asked of all the individuals contacted. Instead, questions were tailored for each situation.

However, as a guide to the types of questions and probes used to collect data, a data acquisition form is provided as Exhibit A-3, following Exhibit A-2.

As can be seen from Exhibit A-3, industry representatives were generally asked questions regarding:

- Plant type, size, locations, etc.
- Processing methods
- Waste stream generation
- Waste properties
- Treatment and disposal methods
- Costs for treatment and disposal of potentially hazardous wastes.

In addition, the representatives were asked if they would supply the Study Team with waste samples for analysis in our laboratories. The results of the sampling program are described in Appendix B and in the body of the report.

Exhibit A-4, following Exhibit A-3, tabulates significant production processes used in SICs 282 (Plastic Materials and Synthetic Industry) and SIC 30 (Rubber Production Industry). As presented by the exhibit, there are approximately 100 commercially significant processes. During the data collection phase of this study, more than 60 field trips were made. A field trip is defined as a visit to a plant site. However, in many cases, visits were actually made to a plant complex using more than one major process. Therefore, processes observed significantly exceeded field trips completed and provided coverage of most relevant processes in use at the time of the study. Exhibit A-5, following Exhibit A-4, provides a breakdown of contacts by groups visited. In addition, to the field trips, between 200 and 250 telephone calls were made to industry representatives to supplement data.

Exhibit A-6, following Exhibit A-5, provides the distribution of waste samples obtained and analyzed. Note that the purpose of the spot sampling program was to provide evidence of the reliability of assumptions made concerning the general composition of the wastes and the concentrations of related components.

2. DATA ANALYSIS

Data analysis generally involved:

- Definition of processes used to manufacture materials
- Estimate of waste streams and wastes generated from each unit operation by waste type and quantity
- Classification of wastes into non-hazardous and potentially hazardous categories
- Determination of waste disposal methods, their adequacy and their costs
- Estimating the quantity of potentially hazardous wastes to be disposed of by state and EPA regions and nationwide for the year 1974, 1977 and 1983.

Estimates of potentially hazardous wastes to be disposed of on a geographic basis were made by:

- Developing hazardous waste factors (as the weight of hazardous waste per weight of product produced) for a typical process type in a representative plant.
- Multiplying these factors by the volume of production in a given geographic area.
- Adding wastes produced by geographic area to arrive at national numbers.

Current production values and plant location were obtained from data, industry-supplied information, other published literature and professional judgments.

To obtain projections of potentially hazardous wastes to be disposed of in the years 1977 and 1983 industry production was estimated through a computer-based economics model, known as INFORUM -- Interindustry Economic Research Project of the University of Maryland.

The INFORUM model uses input-output (I/O) analysis to make long-term forecasts of the American economy. I/O analysis is based on the concept that the outputs on production of one industry can be translated into inputs or consumption in other industries. The model uses 200 industry groupings or sections to cover the entire economy.

The modeling process involves an estimation of consumption, investment, employment and export and import functions for each sector, using various alternative scenario assumptions about government expenditures, cost of capital, import/export restrictions and various technological developments. The forecasts proceed year-by-year for a decade into the future.

The value of wastes is estimated from the projected value (deflated to constant dollars) of material consumption and final production in each industry for selected years and from the waste generation factors calculated for typical processes. Based on an anlysis of projected versus actual production and consumption as actual data becomes available, it is known that the INFORUM model provides a reasonably accurate means for estimating economic conditions.

3. DEFINITION OF POTENTIALLY HAZARDOUS WASTES

Under the time and budgetary constraints of the project, it was, of course, impossible to carry out detailed original toxicological, chemical, biological and other investigations to determine the potential hazard from the literally thousands of chemical substances in these industries which may become wastes. Instead, we relied on several published sources which are compendia of much of the required information. These sources are:

- Reference 1 -- Dangerous Properties of Industrial Materials (4th Ed.) N. Irving Sax, Van Nostrand New York: Reinhold Company, 1974.
- Reference 2 -- Clinical Toxicology of Commercial Properties (3rd Ed.) Gleason, Gosselin, Hodge and Smith, Baltimore: The Williams & Wilkins Co., 1969.
- Reference 3 -- A Study of Hazardous Waste Materials, Hazardous Effects and Disposal Methods, Booz, Allen Research, Inc., United States Environmental Protection Agency (Contract #68-03-0032), Cincinnati, Ohio: 1972.

The following paragraphs detail the parameters which were used in determining if a waste as defined in the study may be potentially hazardous.

3.1 Toxic Substances Were Defined On The Basis Of Oral Toxicity

The following toxic effects may occur in an acute form or chronic form or both, and may jeopardize the health and welfare of humans and the safety and propagation of terrestrial or aquatic life forms:

- Oral toxicity
- Inhalation toxicity
- Dermal penetration toxicity
- Dermal irritation reaction
- Aquatic toxicity
- Phytotoxicity.

For the pupose of this study, oral toxicity was accepted as the basis for defining a toxic substance because much more data is generally available to support published conclusions based on this parameter.

References 1 and 2 above were chosen as the primary sources determining if the wastes contain toxic materials. Two works were chosen for use because many substances needed to be categorized.

The most serious deficiency of the literature for the purposes of the project is that it is nearly all occupationally or laboratory oriented. The result is that toxic effects documented are responses to higher concentrations than levels which may be expected to accrue from deposition of relatively small quantities of these substances in landfill. Since few epidemiological facts are available, information developed on the basis of occupational or laboratory exposure was substituted.

The two references selected as our primary toxicological data base use different scales for rating a substance's toxicity:

- Exhibit A-7, following Exhibit A-6, presents the toxicity rating scale for Reference 1.

- Exhibit A-8, following Exhibit A-7, presents the scale for Reference 2.

In the determination of a waste constituents' toxicity, a conservative approach was chosen, since information contained in the reference may be based on more unknown factors than known ones. Therefore, any substance having a toxicity rating 2 (moderate) or above including U (unknown) in Reference 1; and 3 (moderate) and above, in Reference 2, was considered toxic in the context of this study. Wastes containing such substances in either the pure form or combined with other materials were considered potentially hazardous.

3.2 The Potential For Flammability, Explosivity And Reactivity/Corrosivity Of The Wastes Was Ranked

Human health and welfare, as well as animal and vegetation, may be exposed to hazardous situations involving flames and/or explosions caused by some substances. Other adverse effects may occur as a result of rapid or violent chemical reactions of substances. Flame, explosion or reactions produce heat which causes many compounds to emit highly toxic fumes or to react more vigorously with oxidizing materials. Some compounds can react rapidly with ground water, for example, to produce toxic or flammable vapors. Acids may be produced by reactions, and heat generated by flame or reaction may itself be a serious hazard to many ecosystems.

Just as there are levels of toxicity, there are degrees of flammability, explosivity and reactivity. To judge the potential hazard of the wastes in terms of these factors, we relied heavily on Reference 3 where many substances have been ranked as to their potential hazard capacity in this area.

In addition, information contained in the other two references was taken into account. Also, any waste substance with a flash point of 38°C (100°F) or higher (as measured by the Tag Open Tester), where known, were deemed potentially hazardous. This is the limit which has been made by the Department of Transportation to designate hazardous flammable solvents which require a red warning level.

The hazards rating criteria for flame explosion and reaction/corrosion in soil from Reference 3 is presented in Exhibit A-9, following Exhibit A-8. Any waste containing substances having a rating above 2 (moderate hazard) including U (unknown) was considered to be potentially hazardous.

If any constituent of a waste stream met the criteria described above as hazardous for any of the categories, the waste was considered potentially hazardous. Spot sampling of the waste (described in Appendix B) was used to confirm assumption on the presence of potentially hazardous components in the wastes.

EXHIBIT A-1
STUDY LOGIC

I. ANALYSES TO BE PERFORMED

- INDUSTRY CHARACTERIZATION: TASK 1
- WASTE CHARACTERIZATION AND SCREENING: TASK 2
- TREATMENT AND DISPOSAL TECHNOLOGY CHARACTERIZATION: TASK 3
- COST ANALYSIS OF DISPOSAL TECHNOLOGY: TASK 4

II. WASTE DISPOSAL PRACTICE

RUBBER AND PLASTICS INDUSTRIES

Wastes Destined For Land Disposal(1) (2)

- Wastes whose physical properties are typified by
  - solid
  - liquid
  - sludge phases
- Wastes directly generated from manufacturing processes
- Wastes produced by air or water pollution control procedures

HAZARDOUS WASTES

Especially those containing: asbestos, arsenic, beryllium, cadmium, chromium, copper, cyanides, lead, mercury, halogenated hydrocarbons, pesticides, selenium, zinc and carcinogens, including those which are radioactive.

POTENTIALLY HAZARDOUS WASTES

i.e., those which might be suspected to cause a reaction and form a hazardous substance.

WASTE DISPOSAL METHODS INCLUDING:

- Burial; deeper surface
- Chemical and biological detoxification
- Lagooning
- Recovery and reuse
- Deep well injection
- Mine disposal
- Open burning
- Incineration
- Open dumping
- Combinations of the above
- Ocean dumping

II. DESIRED OUTPUTS

- INDUSTRY DESCRIPTION
  - Plants and locations
  - Distribution of number of firms and plants
  - Distribution of plant size as a function of employees
  - Manufacturing process distribution
  - Location distribution
  - Age distribution
  - Product line
- METHODS OF WASTE TREATMENT AND DISPOSAL
  - Detailed waste description and disposal methodology
  - Process changes necessitated by reduction in hazardous waste production
  - Levels of proficiency for disposal based on survey
    - .. Level I - techniques presently employed
    - .. Level II - best technology currently employed
    - .. Level III - technology necessary to provide adequate health and environmental protection = developing technology beyond Level II
- COSTS OF ADEQUATE DISPOSAL
  - Investment costs
  - Operating costs

Notes: (1) Wastes destined for release to air or water at plant site are viewed to be outside the scope of this study.

(2) Includes industry waste quantification on state and national levels. (wet and dry basis)

Source: Snell review and analysis of study requirements.

EXHIBIT A-2

TASK DEFINITION

Task	Description
1.	Industry Characterization
2.	Waste Characterization and Screening
2.1	. Develop material balance around each 4 digit SIC sector and engineering material balances for the individual processes of commercial significance ~100
2.2	. Develop hazardous materials priority list by process based on the substances identified in 2.1 and review with Project Officer
2.3	. Rank processes for potential for production of wastes destined for land disposal
2.4	. Develop priority decision model to screen out 20 processes (for budget purposes) for detailed studies in Tasks 3 and 4; - Use the following parameters .. Hazard potential related to materials consumed based on Task 2.2 .. Process potential for producing wastes destined for land disposal, based on Task 2.3 .. Prevalence, based on Task 1, related to output, number of plants and average size - Assign scores to these parameters and aggregate with hazard potential given highest weight - The higher the aggregate score, the higher the priority - The 20 processes with the highest scores will be studied in depth after the Project Officer's approval
2.5	. Develop detailed engineering material balances and definition of practices around the 20 processes to be studied further and characterize wastes using sampling and analysis where required
3.	Treatment and Disposal Technology Characterization for the 20 Priority Processes from Task 2
4.	Cost Analysis of Disposal Technology for the 20 Priority Processes from Task 2

Source: Foster D. Snell Inc.

EXHIBIT A-3(1)
CONDENSED INTERVIEWEE FORM

DATA ACQUISITION FORM

For

EPA Contract No. 68-01-3194

Assessment Of Industrial Hazardous Waste Practices
In The Rubber And Plastics Industry

Foster D. Snell, Inc. is conducting this survey to provide data base regarding:

- What process industrial wastes are generated (industrial waste is defined as any waste other than direct emissions to air or water effluents, where air and water treatment residues and other solids or liquids destined for land disposal are included).
- In what quantities and from what specific process steps are these wastes generated.
- How they are treated and disposed of.

Points of contacts in responding to the attached data acquisition inquiry are:

Mr. Joel M. Kushnir, Survey Coordinator or
Mr. Stephen F. Nagy, Research Director
Foster D. Snell, Inc.
Hanover Road
Florham Park, New Jersey 07932
(201)-377-6700

Name/Title of Contact _____

Company Address/Phone Number _____

_____

_____

Snell Interviewer _____ Date _____

Visit _____ Phone Interview _____

EXHIBIT A-3(2)

1. BRIEF PROCESS DESCRIPTION

   a. Products

   b. Plant Location and Age

   c. Plant Capacity/Average Capacity Use

   d. Major Process Steps (including receiving and shipping)

   e. Material Balances (emphasizing solid waste generation)

2. WASTE GENERATION RATES BY OPERATION

Source	Type of Waste	Quantity (Per Unit Of Production)
a		
b		
c		

3. WASTE CHARACTERIZATION (see list on next page and fill in appropriate data)

Source/Type of Waste	Physical Characteristics	Chemical Characteristics
a		
b		
c		

Sampling Comments (Ask if they would let us visit. Can we take representative samples? Note possible arrangement).

CHECKLIST FOR PHYSICAL/CHEMICAL ANALYSIS DATA

Physical	General Chemical Categories	Specific Chemicals
	Plants Rubber	

4. ON-SITE TREATMENT AND DISPOSAL PRACTICES

Type of Waste/ Source	Treatment And/Or Disposal Technology Used	Are There Alternate Methods?	Cost		
			Capital*	Operating	Maintenanc
a					
b					
c					

Overall (Ask for comments on operating procedures, personnel training, etc.)

*Indicate year of investment.

5. OFF-SITE TREATMENT AND DISPOSAL PRACTICES*

Type of Waste/ Source	Treatment And/Or Disposal Technology Used	Are There Alternate Methods	Cost		
			Capital**	Operating	Maintenanc
a					
b					
c					

Overall (Enter general comments here)

* Please note whether plant or private contractor is removing, treating or disposing the wastes.

**Indicate year of investment.

6. TREATMENT AND DISPOSAL SERVICE EVALUATION

- Who is contractor?
- Why was he chosen?
- What does he do with your wastes? (Type of facility: municipal or sanitary landfill, etc.)
- Do you have criticism of his procedures?

7. OPINION ON CONTROL LEVELS I, II, AND III (Ask by type of waste and control technology; include cost factors)

Level I - Prevalent Treatment and Disposal Practices
Level II -- Best Available Disposal Practices
Level III -- Environmentally Adequate Disposal Practices
Trends -- Are you looking into alternate methods? Do you expect an increase or decrease in wastes to be disposed of due to process changes, local regulations, etc.?

8. WHO ELSE SHOULD WE CONTACT?

Thank you

EXHIBIT A-4(1)
TABULATION OF SIGNIFICANT PROCESSES
IN SICs 282 AND 30

SIC	Industry	The Major Categories From Which 20 Processes Will Be Screened For Tasks 3 and 4 Study	Comments	Approx. No. Of Commercially Significant Processes
2821	Plastics Materials and Resins	. Thermosetting - Alkyds - Polyesters - Phenolic and other tar resins - Amino resins	. Candidates listed in this category represent 89% of all thermosetting plastics and resin materials produced in 1972.	
		. Thermoplastics - Polyethylene and copolymers - Polypropylene - Styrene resins - Vinyl resins - Others(3)	. Candidates listed in this category represent 77% of all thermoplastics produced in 1972.	40
2822	Synthetic Rubber (vulcanizable elastomers)	. S-type rubber . Butyl rubber . Stereo polybutadiene elastomers . Others(3)	. These study candidates represent 67% of 1973 domestic synthetic rubber production.	15
2823	Cellulosic Man-Made Fibers	. Rayon . Acetate fibers		5
2824	Organic Fibers, Non-Cellulosic	. Nylon . Acrylic and Modacrylic . Polyester		10
3011	Tires and Inner Tubes	. Tires . Inner Tubes	. Industries classified under SICs 3011, 3021, 3031 and 3069 probably have a lower relative hazard potential in their wastes compared to the others on the list.	5

SIC	Industry	The Major Categories From Which 20 Processes Will Be Screened For Tasks 3 and 4 Study	Comments	Approx. No. Of Commercially Significant Processes
3021	Rubber Footwear	. Canvas footwear . Waterproof footwear	. Wastes produced by industries classified in SICs 3011, 3021 and 3069 are similar. Compounding ingredients are the likely potential hazards in their waste streams.	5
3031	Reclaimed Rubber	Reclaimed rubber	The digester process is the major process in this SIC, representing 46.6% of production volumn in 1973.	3
3069	Fabricated Rubber Products N.E.C. (including plastic hose and belting, SIC 3041)	Rubber and plastics belts and belting Rubber hose and tubing Sponge and foam rubber goods Rubber floor and wall covering Mechanical rubber goods, n.e.c.(4) Rubber heels and soles Druggist and medical sundries Other rubber goods, n.e.c.(4) Fabricated rubber products, n.e.c., n.s.k.(4)		20
		TOTAL(5)		103

Notes:

(1) Based on Snell experience with previous study projects on the rubber and plastics industry.

(2) Based on responses obtained from telephone interview campaign. Visits will be to those plants in a position to provide meaningful information as assessed by the telephone interviews.

(3) These will be studied only if they are shown to produce especially hazardous wastes.

(4) These classifications are "catchalls" for a wide variety of miscellaneous products. By and large, the major process found here is molding.

(5) Of the total telephone interviews to be made 20% will be of industry organizations, 10% will be of waste disposal firms and the remainder of the industries themselves. Approximately 10 visits will be to industry organizations, 5 to disposal firms and 70 to plants.

Source: Foster D. Snell, Inc.

EXHIBIT A-5
DISTRIBUTION OF FIELD
TRIPS COMPLETED

Group Visited	Field Trips Allocated		Field Trips Performed (2)	
. Plants (1)				
SIC 2821	20		19	
SIC 2822	12		13	
SIC 2823	6		2	
SIC 2824	6		7	
SIC 3011	6		8	
SIC 3031	3		1	
SIC 3041	4		4	
SIC 3069	5		10	
		70		64
. Waste Disposal Facilities	5		10	
		5		10
. Industry Associations	10		9	
		10		9
. Government Agencies	0		5	
				5
Totals		85		88

(1) A field trip is defined as a visit to a plant site. However, in many cases visits were actually made to a plant complex where more than one major process exists. Therefore, processes observed exceeded field trips completed.

(2) Associated with the field trips were between 200 and 250 telephone calls to industry representatives for obtaining appointments and data.

Source: Foster D. Snell, Inc.

EXHIBIT A-6
WASTE SAMPLING AND ANALYSIS BY STANDARD INDUSTRIAL CLASSIFICATION (SIC)

SIC	Number of Samples Obtained	Number Of Samples Analyzed
2821	8	6
2822	4	4
2823	2	2
2824	16	9
3011	4	4
3021	2	2
3031	3	3
3041	4	4
3069	5	5
Total	48	39

NOTE: The sampling program provides spot evidence of the reliability of assumptions made concerning the general composition of the wastes and the concentrations of selected components.

Source: Foster D. Snell, Inc.

EXHIBIT A-7
TOXIC HAZARD RATING SCALE FOR
REFERENCE 1

Toxicity Rating	Definition
0	NONE: (a) No harm under any conditions (b) Harmful only under unusual conditions or overwhelming dosage.
1	SLIGHT: Causes readily reversible changes which disappear after end of exposure.
2	MODERATE: May involve both irreversible and reversible changes not severe enough to cause death or permanent injury.
3	HIGH: May cause death or permanent injury after very short exposure to small quantities.
U	UNKNOWN: No information on humans considered valid by authors.

Source: Dangerous Properties of Industrial Materials, 4th Ed.
N. Irving Sax, Van Nostrand Reinhold Company,
New York, 1974.

EXHIBIT A-8

TOXIC HAZARD RATING SCALE FOR REFERENCE 2

Toxicity Rating	Definition	Probable Lethal Dose (Human) Mg/Kg	For 70 Kg Man (150 lbs)
1	Practically non-toxic	above 15 gm/Kg	more than 1 quart
2	Slightly toxic	5 - 15	between 1 pint and 1 quart
3	Moderately toxic	500 - 5	between 1 ounce and 1 pint (or 1 lb.)
4	Very toxic	50 - 500	between 1 teaspoonful and one ounce
5	Extremely toxic	5 - 50	between 7 drops and 1 teaspoonful
6	Super toxic	less than 5	a taste (less than 7 drops)

Source: Clinical Toxicology of Commercial Products (3rd Ed), Gleason, Gosselin, Hodge and Smith, The Williams & Wilkins Co., Baltimore, 1969.

EXHIBIT A-9
FLAME, EXPLOSION AND REACTION/
CORROSION HAZARD RATING SCALE
FOR REFERENCE 3 (In Soil)

FER/C Rating	Definition
1	MINIMAL: Generally stable substances. Very limited potential for reaction or combustion. No toxic fumes or vapors associated with any reactions or combustions that may occur.
2	MODERATE: Can readily undergo violent chemical change with rapid release of energy, but will not detonate explosively or react violently except under very special circumstances such as heating under confinement. Can ignite and burn rapidly or react to produce harmful, though not lethal, vapors and fumes if exposed to modest increase of temperature or if moisture is encountered.
3	SEVERE: Readily capable of detonation and explosive decomposition or reaction at normal ambient temperatures and pressures. Will detonate as result of mechanical shock or local thermal shock. Reacts readily with own oxides or with other oxidizing materials. Can ignite spontaneously and/or react violently if exposed to moisture in soil. Ignition or reaction can produce lethal vapors, fumes, etc.
U	Unknown

FER/C = Flame, Explosion and Reaction/Corrosion

Source: A Study of Hazardous Waste Materials, Hazardous Effects and Disposal Methods, Booz, Allen Applied Research, United States Environmental Protection Agency (Contract #68-03-0032), Cincinnati, Ohio, 1972.

APPENDIX B -- PROTOCOLS USED AND RESULTS OBTAINED IN ANALYSIS OF WASTE STREAM SAMPLES

This appendix presents the protocols used and the results obtained in the analysis of waste stream samples generated by the rubber and plastics industry. Spot samples were taken under the supervision of Snell personnel at the points of generation of the wastes.

1. ANALYTICAL PROTOCOLS

The detailed protocols are presented in the following paragraphs with reference to standard tests where warranted.

(1) Total Solids

The test was performed in accordance with the "Standard Methods For the Examination of Water and Waste Water", APHA, 13th Edition, 1971, pp. 288-290.

(2) Water Content

By Toluene Distillation Method -- adopted from "Official Methods of Analysis of the Association of Official Analytical Chemists", 12th Edition, 1975, p. 129.

(3) Ash Residue

The sample is weighed into a porcelain crucible and ashed on a Meeker Burner at 600°C. After ashing, the residual weight is determined and the percent ash calculated. The residue is used for emission spectroscopy semi-quantitative determination.

(4) Emission Spectroscopy

A known amount of the ashed material is intimately mixed with 100 mg. of carbon powder followed by addition of 3 ml. of aqua regia. All of the material is evaporated to dryness and gently ignited. The resulting mixture is transferred to an electrode and D.C. arced to completion. A series of standards in a carbon matrix are run along with the sample and semi-quantitative results are obtained for each element employing a Jarrel-Ash Model 3.4 Meter Ebert Emission Spectrograph. The results are then calculated from known standards and are expressed in semi-quantitative manner.

(5) Atomic Absorption Spectroscopy

The samples are digested with nitric acid, filtered and the filtrate diluted with water. The resulting solution is then aspirated into the flame of an atomic absorption spectrophotometer. Known standards are used for calibration of the instrument and for quantitative determination of the element in question.

(6) Organic Chlorides

The Parr Bomb Oxygen Combustion method followed by microcoulometry is employed for the determination of organic chlorides.

(7) Phenols

The determinations are performed in accordance with Method D. for phenols in "Standard Methods for the Examination of Water and Waste Water", APHA, 13th Edition, 1971, pp. 507-508.

(8) Vinyl Chloride Monomer (VCM)

There is no official method for this determination and recently possible interferences from acetaldehyde, resulting from copolymerization of VCM and vinyl acetate, has been reported. The protocol used by Foster D. Snell is as follows:

Solid Samples -- A representative portion of the sample is ground to a fine powder. Two grams of this powder is digested for 6 hours with 40 ml of tetrahydrofuran (THF). The digestion product is centrifuged and the supernatant subjected to gas chromatographic analysis under the following conditions: The gas chromatograph is a Perkin-Elmer 900. The column is 8' x 1/8" O.D. packed with 20% DC 550. The carrier gas is nitrogen flowing at 30 ml/min. The column is operated at 60°C until emergence of THF. The temperature is then raised to 150°C and held for 10 minutes, and then lowered slowly.

Calculations -- A standard is prepared containing 0.5×10^{-9} micrograms of vinyl chloride monomer in THF. A 5 l injection at an attenuation factor of 1 x 4 gives a peak height of 120 mm with a retention time of 0.75 minutes.

The peak height of the extracts, corrected for the appropriate attenuation factor, is used to determine the sample concentration.

2. ANALYTICAL RESULTS

The analytical results for the waste samples obtained from the plant visits and tested by Foster D. Snell, Inc. are presented in the attached Tables.

- TABLE B-1 -- Tests performed on waste samples obtained from plants in SIC 282, Plastic Materials and Synthetics Industry.

- TABLE B-2 -- Tests performed on waste samples obtained from plants in SIC 30, Rubber Products Industry.

TABLE B-1

ANALYTICAL RESULTS OF WASTE SAMPLES OBTAINED IN SIC 282, PLASTIC MATERIALS AND SYNTHETICS INDUSTRY

Product	Waste Description	Ash %	Ion Content[1]																				
			As	B	Ba	Co	Cr	Cu	Mn	Mo	Ni	Pb	Sb	Sn	V	Zn	Hg[2]	Pb[2]	Cd[2]	Organic Cl	Other
Isoprene	Incinerator Ash	57.9		E	D		E	E	D	E	D	E		E		D	0.1	16	0.9		
Nylon 6-6	Warehouse Sweepings	4.8					E	F	E	F	E	E		F		E	0.4	15	1.0		
SBR	Plant Sweepings	57.5			D		E	E	D		D	E				D	1.2	4.0	> 5	1750	
SBR[3]	Catalyst Sludge	13.2				F	E	E	E		C	F					1.8	3.0	0.4		
SBR[3]	Spent Alumina[4]	77.5						E			E			E			0.4	1.5	0.2		
Chlorinated Polyethylene	Incinerator Ash	92.5		C	D		C	D	D	E	E	D		E	E	D	2.1	185	3.4		
Chlorinated Polyethylene	Floor Washes	-		D			E	E	B		E	E	E	E			0.4	1.0	0.1		
Polyvinyl Acetate	Product Waste	-					E	F	E								-	-	-		
Nylon 6-6	Biological Sludge (Irrigation)	Trace												E			0.4	1.5	0.1		
Nylon 6-6	Biological Sludge	Trace			F			F	F			F				F	0.5	5.0	0.2		
Nylon 6-6	Waste Nylon Salt	Trace															0.1	1.0	0.1		
Polyisoprene	Wastewater Sludge	1.1			F		E	F	F			F				E	0.2	1.5	0.1		
Phenolic Resins	Phenolic Residue																			210	Phenols = 8.84%
Chlorinated Polyethylene	Filter (New)					E	C	E			D	E					-	-	-		
Chlorinated Polyethylene	Used Filter					E	C	E			D	E					-	-	-		
Polyvinyl Chloride	Reactor Waste (Emulsion)																				VCM = 35 ppm
Acrylic-Modacrylic	Wastewater Sludge							F								1.6%[5]			0.4		
Polyester	Sludges					F			F										0.1		
Polyester	Dust Collector Dust	64.2			D	C	C	D	D	D	E	A	D				C				
Polyester	Floor Sweepings	2.3			E		E	D	F	F	D	E		E			C				

(1) The results are semi-quantitative except where noted otherwise, and are coded as follows, on an "as is" basis:
A = $>10^{-1}$ ppm ; B = 10^{-1}-10^{0} ppm ; C = 10^{0}-10^{1} ppm ; D = 10^{1}-10^{2} ppm ; E = 10-100 ppm ; F = 1-10 ppm ; Blank = <1 ppm.

(2) By atomic absorption in ppm.

(3) This corresponds to a highly proprietary variant of the product/process and may not be typical of the more conventional processes.

(4) From Butadiene drying columns.

(5) Chemical Assay.

Source: Foster D. Snell, Inc.

TABLE B-2

ANALYTICAL RESULTS OF WASTE SAMPLES
OBTAINED FROM VARIOUS PLANTS IN SIC 30, RUBBER
PRODUCTS INDUSTRY

Main Plant Product	Waste Description	Water Soluble (%)	Water Content (%)	Ash %	Ion Content[1] As	B	Ba	Co	Cr	Cu	Mn	Mo	Ni	Pb	Sb	Sn	V	Zn	Hg[2]	Pb[2]	Cd[2]	Cl (organic)
Tire	Dust from collector	1.21	-	57.1		E	D	D	E	E	D		D	D		E	E	B				
Tire	Floor sweepings	0.76	-	96		E	D		E	E	E		D	D		E	E	C				
Tire	Wet dust collector sludge	0.10	NA	10.4				E						E				C				
Footwear	Warehouse sweepings #1	1.27	NA	57		E	C	E	E	E	D		E	D		E	E	C				
Footwear	Warehouse sweepings #2	1.85	NA	68		E	C	E	E	D	D			D		E	E	C				
Footwear	Compounding room sweepings	4.84	NA	53.2		E	C	E	E	E	E		E			E		B	0.5	72	2.5	612
Reclaim	Used NSW reclaim oil	X	90%	3.7		E			C	D	C		E	C					0.5	3.8	1.0	580
Reclaim	Virgin NSW reclaim oil	X	0%	.08																		
Hose	Scrap yarn	0.38	NA	0.37														C				
Belt	Skivings	0.57	NA	15.7			E			E				E				C				
Belt	Discard fiber	1.03	NA	3.1		E					E		E					C				
Hose	Scrap trim	1.41	NA	1.9														D				
Misc. Rubber	Warehouse sweepings	0.95	NA	58.5			C	E	E	E	D			D		D			1.0	1.0	0.6	450
Misc. Rubber	Dust collectors	1.57	NA	34.3			C	E	E	E	D			D		D			0.7	15	2.5	
Misc. Rubber	Reject stock	1.29	NA	39.4		E	C	E	E	E	E		E	D		E		B				
Misc. Rubber	Flashings	0.21	NA	42.4		E	C	E	E	E	E		E	D		E		B				
Misc. Rubber	Waste oils	X	0%	0.28														D	0.1	3.8	1.0	

NA = Not Applicable X = Not Performed

(1) The results are semi-quantitative except where noted otherwise, and are coded as follows, on an "as is" basis:
A = $>10^5$ ppm ; B = $10^4 - 10^5$ ppm ; C = $10^3 - 10^4$ ppm ; D = $10^2 - 10^3$ ppm ; E = 10-100 ppm ; Blank = < 10 ppm

(2) By atomic adsorption in ppm.

Source: Foster D. Snell, Inc.

APPENDIX C -- HAZARDOUS WASTE CONTRACTORS AND SERVICE ORGANIZATIONS

Table C-1, beginning on the following page, is a list of hazardous waste contractors and service organizations available to the rubber and plastics industry. The table provides the following information:

- Name of organization
- Address
- Type of service provided.

TABLE C-1 (1)

IDENTIFIED HAZARDOUS WASTE CONTRACTORS AND SERVICES OFFERED

Company	Address	Service to Industry[1]											
		CT	NE	BI	PR	OR	FS	FU	AS	CS	IN	LA	RR
REGION I													
The Crago Company, Inc.	P.O. Box 409, Gray, ME	X											X
Safety Projects and Engineering, Inc.	3 Malden St. West Quincy, MA	X											
Silresim Chemical Corp.	86 Tanner St., Lowell, MA	X	X			X		X			X	X	X
Mentvale Laboratories, Inc.	270 Talbot Ave., Dorchester, MA	X	X				X						X
Eastern Smelting and Refining	37 Bubier St., Lynn, MA	X	X		X								X
REGION II													
Chem Trol Pollution Services, Inc.	1550 Balner Road, Model City, NY	X	X	X	X	X	X	X		X	X	X	X
Chemical Waste Disposal Corp.	4219 19th Ave., Astoria, NY	X			X							X	X
Frontier Chemical Waste Process, Inc.	4626 Royal Ave., Niagara Falls, NY	X	X		X	X	X				X	X	X
Pollution Abatement Services	East Seneca St. Oswego, NY										X		
Recycling Laboratories	112 Harrison Place, Syracuse, NY	X	X		X						X		X
Modern Transportation Co.	75 Jacobs Ave., Kearny, NJ	X	X										
Chemical Control Corp.	23 South Front St., Elizabeth, NJ	X	X		X						X	X	X
Astro Pak	1056 Route 1, Edison, NJ	X	X									X	
Marisol Inc.	125 Factory Lane, Middlesex, NJ	X	X									X	X
Scientific Inc.	17 East Second St., Scotch Plains, NJ	X	X									X	
Rollins Environmental Services	Bridgeport, NJ	X	X		X		X	X			X	X	X
Scientific Chemical Processing, Inc.	216 Patterson Plank Rd., Carlstadt, NJ	X	X								X	X	X
Chemical Waste Disposal, Inc.	25 So. Front St., Elizabeth, NJ	X	X		X						X	X	X
Gaess Environmental Services, Inc.	253 River Drive, Passaic, NJ	X										X	
National Converters, Inc.	420 Chestnut St., Union, NJ	X	X									X	X
REGION III													
Rollins Environmental Services	One Rollins Plaza, Wilmington, DE	X	X	X	X	X	X	X			X	X	X
American Recovery Corp.	2001 Benhill Ave., Baltimore, MD	X	X		X		X					X	X
American Recovery Corp.	901 Recovery Road, Baltimore, MD	X	X	X	X							X	X
Pottstown Disposal Service	Route 20, Sell Road, Pottstown, PA											X	
Sitkin Metal Industries, Inc.	P.O. Box 708, Lewistown, PA	X	X		X								X
Chem-Line	P.O. Box 545, Phoenixville, PA	X	X									X	
U.S. Utilities Corp.	407 Mall Circle Dr., Monroeville, PA	X	X	X			X					X	X
Liquid Waste Disposal of Virginia	4922 Chamberlayne Ave., Richmond, VA	X									X		

TABLE C-1 (2)

Company	Address	Service to Industry[1]											
		CT	NE	BI	PR	OR	FS	FU	AS	CS	IN	LA	RR
REGION IV													
Liquid Waste Disposal, Inc.	P.O. Box 19063, Louisville, KY	X	X		X						X		X
Nuclear Engineering Co., Inc.	Box 7246, Louisville, KY	X										X	X
Petrolite Corp.	Calvert City, KY site		X		X						X	X	X
Destructo-Chemway Corp.	P.O. Box 667, Cason St., Belmont, NC	X	X		X						X		X
Wasteplex, Inc.	P.O. Box 396, Jamesboro, TN	X	X	X	X						X	X	X
Browning-Ferris Industries	Georgia, BFI site	X	X								X	X	X
Lanham Waste Control Inc.	Georgia, BFI site	X	X										X
REGION V													
Chem Met Services	18550 Allen Road, Wyandotte, MI	X	X	X								X	
Environmental Waste Control, Inc.	26705 Michigan Ave., Inkster, MI	X	X		X			X			X	X	X
Liquid Disposal Company	3901 Hamblin Road, Utica, MI		X		X						X		X
Nelson Chemicals Co.	12345 Schaefer Highway, Detroit, MI	X	X			X	X	X			X		
Pronco Manufacturing Co.	Stephenson Hwy. Madison Heights, MI										X		
Pollution Controls Corp.	1321 University Ave., St. Paul, MN	X									X	X	
Erieway Pollution Control	33 Industry Drive, Bedford, OH	X	X			X	X					X	X
Koski Construction Co.	5841 Woodman Ave., Ashtabula, OH	X	X									X	
Systems Technology Corp.	Baxter Road, Franklin, OH		X		X	X	X				X	X	
Hyon Waste Management Services	11700 Stony Island Ave., Chicago, IL	X	X	X		X					X		X
Nuclear Engineering Co., Inc.	Ohio Nuclear Site											X	
Waste Management, Inc.	900 Jorie Blvd., Oak Brook, IL	X	X		X							X	
American Recovery Corp.	Riley Rd., East Chicago, IL	X										X	X
Conservation Chemical Company	Box 6066, Gary, IN	X	X									X	X
Seymour	500 North Broadway, Seymour, IN	X									X		X
American Chemical Service	P.O. Box 190, Griffith, IN	X									X		X
Approved Chemical Treatment	3755 Linden Ave., Grand Rapids, MI	X	X		X		X				X	X	X
Ohio Liquid Disposal, Inc.	504 Liberty Street, Fremont, OH	X	X		X							X	X
Chem-Line	Box F, Lisbon, OH	X	X	X	X							X	X
Browning-Ferris of Ohio	1901 So. Pine St., Warren, OH	X	X	X	X		X				X	X	X
Rodgers Laboratories	413 So. 6th St., Milwaukee, WI	X	X	X	X							X	X
Waste Research and Reclaimation Company, Inc.	Route 3, Eau Claire, WI	X	X	X	X		X				X	X	X
Chem Dyne Corp.	230 Northland Blvd., Cincinnati, OH	X	X								X	X	

Company	Address	Service to Industry[1]											
		CT	NE	BI	PR	OR	FS	FU	AS	CS	IN	LA	RR
REGION VI													
Rollins Environmental Services	Baton Rouge, LA, Rollins Site	X	X	X	X	X					X	X	X
U.S. Pollution Control, Inc.	5024 South Quaker, Tulsa OK	X	X					X				X	X
Bioecology Systems, Inc.	4100 East Jefferson, Grand Prarie, TX	X	X	X		X	X				X	X	X
Browning-Ferris Inc.	300 Fannin Bank Bldg., Houston, TX	X	X	X	X	X	X				X	X	X
Malone Service Company	P.O. Box 709, Texas City, TX	X	X					X				X	X
Petrolite Corp.	Box 2546, Houston, TX		X	X	X						X	X	X
Servi International	P.O. Box 47088, Dallas, TX	X	X									X	
Texas Ecologists, Inc.	Robston, TX	X	X		X						X	X	X
Texas Liquid Disposal Co.	511 West Texas, Midland, TX	X						X				X	X
Sheridan Disposal Service, Inc.	Box 42, Hempsted, TX		X		X						X		X
REGION VII													
Conservation Chemical Co.	215 W. Pershing Rd., Kansas City, MO	X	X		X		X	X		X		X	X
Monsanto Corp.	800 North Lindbergh, St. Louis, MO										X		
Findett Corporation	Elm Point Rd., St. Charles, MO	X					X						X
Wheeling Disposal Services	1805 So. 8th St., St. Joseph, MO	X										X	
BFI of Kansas City, Inc.	Kansas City, MO, BFT Site	X	X			X						X	
REGION VIII													
Denver Clean-Up Services, Inc.	3001 Walnut Street, Denver, CO	X										X	
REGION IX													
Casmalia Disposal Site	P.O. Box 5275, Santa Barbara, CA				X							X	X
Chancellor and Ogden, Inc.	3031 East I Street, Wilmington, CA	X										X	
Environmental Protection Corp.	1801 Oak St., Bakersfield, CA			X								X	
Fresno County Dept. of Public Works	4499 E. Kings Canyon Rd., Fresno CA											X	
Hollister Disposal Site	Hollister, CA											X	
Industrial Tank Co.	210 Berellesa St., Martiney, CA	X	X	X	X						X	X	X
County of Los Angeles Site	1955 Workman Hill Rd., Whittier, CA											X	
Palos Verdes Landfill												X	
Calabasa Landfill												X	
Omar Rendering Company	P.O. Box 1236, Chula Vista, CA	X	X		X							X	
Richmond Sanitary Service	1224 Nevin Rd., Richmond, CA	X										X	
San Diego County Site	5555 Overland Road, San Diego, CA											X	

TABLE C-1 (4)

Company	Address	Service to Industry[1]											
		CT	NE	BI	PR	OR	BS	FU	AS	CS	IN	LA	RR
REGION IX (continued)													
Ventura Cty. Dept. of Public Works	597 East Main St., Ventura, CA											X	
Nuclear Engineering Co., Inc.	Box 156, San Ramon, CA											X	
Liquid Waste Management	9100 De Gormo, Sun Valley, CA	X										X	
Roberts Liquid Disposal	14708 Studebaker Rd., Norwalk, CA	X										X	
REGION X													
Wes Con, Inc.	245 Third Ave. E., Twin Falls, ID											X	
Chemical Processors, Inc.	5501 Airportway, So., Seattle, WA	X			X	X	X						X
Nuclear Engineering Co., Inc.	Beatty, NV, Nuclear Engineering Site	X										X	
Resource Recovery Corp.	5501 Airportway, So., Seattle, WA	X			X							X	X
Western Processing Co., Inc.	7215 South 196th St., Kent, WA	X	X		X			X					X

(1) Abbreviation Code:

CT	Collection and Transport	FU	Filtration
NE	Neutralization	AS	Ammonia Stripping
BI	Biological	CS	Carbon Sorption
PR	Precipitation	IN	Incineration
OR	Oxidation-Reduction	LA	Landfill
FS	Floculation-Sedimentation	RR	Resource Recovery

Source: Foster D. Snell, Inc.

Appendix D. DETAILED DEFINITION OF THE PLASTICS AND RUBBER INDUSTRY -- SICs 282 AND 30

Exhibits D-1 through D-9 present a detailed definition for each of the industry segments of SIC 282 and SIC 30.

SIC 2821 PLASTICS MATERIALS, SYNTHETIC RESINS, AND NONVULCANIZABLE ELASTOMERS

Establishments primarily engaged in manufacturing synthetic resins, plastics materials, and nonvulcanizable elastomers. Important products of this industry include: cellulose plastic materials; phenolic and other tar acid resins; urea and melamine resins; vinyl resins; styrene resins; alkyd resins; acrylic resins; polyethylene resins; polypropylene resins; rosin modified resins; coumarone-indene and petroleum polymer resins; and miscellaneous resins including polyamide resins, silicones, polyisobutylenes, polyesters, polycarbonate resins, acetal resins, fluorohydrocarbon resins; and casein plastics. Establishments primarily engaged in manufacturing fabricated plastics products or plastics film, sheet, rod, nontextile monofilaments and regenerated cellulose products, and vulcanized fiber are classified in Industry 3079, whether from purchased resins or from resins produced in the same plant. Establishments primarily engaged in compounding purchased resins are also classified in Industry 3079. Establishments primarily manufacturing adhesives are classified in Industry 2891.

Acetal resins
Acetate, cellulose (plastics)
Acrylic resins
Acrylonitrile-butadiene-styrene resins
Alcohol resins, polyvinyl
Alkyd resins
Allyl resins
Butadiene copolymers, containing less than 50% butadiene
Carbohydrate plastics
Casein plastics
Cellulose nitrate resins
Cellulose propionate (plastics)
Coal tar resins
Condensation plastics
Coumarone-indene resins
Cresol-furfural resins
Cresol resins
Dicyandiamine resins
Diisocyanate resins
Elastomers, nonvulcanizable (plastics)
Epichlorohydrin bisphenol
Epichlorohydrin diphenol
Epoxy resins
Ester gum
Ethyl cellulose plastics
Ethylene-vinyl acetate resins
Fluorohydrocarbon resins
Ion exchange resins
Ionomer resins
Isobutylene polymers
Lignin plastics
Melamine resins
Methyl acrylate resins
Methyl cellulose plastics
Methyl methacrylate resins
Molding compounds, plastics
Nitrocellulose plastics (pyroxylin)
Nylon resins
Petroleum polymer resins
Phenol-furfural resins
Phenolic resins
Phenoxy resins
Phthalic alkyd resins
Phthalic anhydride resins
Polyacrylonitrile resins
Polyamide resins
Polycarbonate resins

Polyesters
Polyethylene resins
Polyhexamethylenediamine adipamide resins
Polyisobutylenes
Polymerization plastics, except fibers
Polypropylene resins
Polystyrene resins
Polyurethane resins
Polyvinyl chloride resins
Polyvinyl halide resins
Polyvinyl resins
Protein plastics
Pyroxylin
Resins, phenolic
Resins, synthetic: coal tar and non-coal tar
Rosin modified resins
Silicone fluid solution (fluid for sonar transducers)
Silicone resins
Soybean plastics
Styrene resins
Styrene-acrylonitrile resins
Tar acid resins
Urea resins
Vinyl resins

Source: 1972 Standard Industrial Classification Manual

EXHIBIT D-2
DEFINITION OF SIC 2822

SIC 2822 SYNTHETIC RUBBER (VULCANIZABLE ELASTOMERS)

Establishments primarily engaged in manufacturing synthetic rubber by polymerization or copolymerization. An elastomer for the purpose of this classification is a rubber-like material capable of vulcanization, such as copolymers of butadiene and styrene, or butadiene and acrylonitrile, polybutadienes, chloroprene rubbers, and isobutylene-isoprene copolymers. Butadiene copolymers containing less than 50% butadiene are classified in Industry 2821. Natural chlorinated rubbers and cyclized rubbers are considered as semifinished products and are classified in Industry 3069.

Acrylate type rubbers
Acrylate-butadiene rubbers
Acrylic rubbers
Adiprene
Butadiene-acrylonitrile copolymers (over 50% butadiene)
Butadiene rubbers
Butadiene-styrene copolymers (over 50% butadiene)
Butyl rubber
Chlorinated rubbers, synthetic
Chloroprene type rubbers
Chlorosulfonated polyethylenes
Cyclo rubbers, synthetic
EPDM polymers
Elastomers, vulcanizable (synthetic rubber)
Epichlorohydrin elastomers
Estane
Ethylene-propylene rubbers
Fluoro rubbers
Fluorocarbon derivative rubbers
Hypalon
Isobutylene-isoprene rubbers
Isocyanate type rubber
Isoprene rubbers, synthetic
Neoprene
Nitrile-butadiene rubbers
Nitrile-chloroprene rubbers
Nitrile type rubber
N-type rubber
Polybutadienes
Polyethylenes, chlorosulfonated
Polyisobutylene-isoprene elastomers
Polyisobutylene (synthetic rubber)
Polymethylene rubbers
Polysulfides
Pyridine-butadiene copolymers
Pyridine-butadiene rubbers
Rubber synthetic
Silicone rubbers
S-type rubber
Stereo regular elastomers
Styrene-butadiene rubbers (50% or less styrene content)
Styrene-chloroprene rubbers
Styrene-isoprene rubbers
Thiol rubbers
Urethane rubbers
Vulcanized oils

Source: 1972 Standard Industrial Classification Manual

SIC 2823 CELLULOSIC MAN-MADE FIBERS

Establishments primarily engaged in manufacturing cellulosic fibers (including cellulose acetate and regenerated cellulose such as rayon by the viscose or cuprammonium process) in the form of monofilament, yarn, staple or tow suitable for further manufacturing on spindles, looms, knitting machines or other textile processing equipment. Establishments primarily engaged in manufacturing textile glass fibers are classified in Industry 3229.

Acetate fibers
Cellulose acetate monofilament, yarn, staple, or tow
Cellulose fibers, man-made
Cigarette tow, cellulosic fiber
Cuprammonium fibers
Fibers, cellulose man-made
Fibers, rayon
Horsehair, articificial: rayon
Nitrocellulose fibers
Rayon primary products: fibers, straw, strips, and yarn
Rayon yar, made in chemical plants (primary products)
Regenerated cellulose fibers
Triacetate fibers
Viscose fibers, bands, strips, and yarn
Yarn, cellulosic: made in chemical plants (primary products)

Source: 1972 Standard Industrial Classification Manual

EXHIBIT D-4
DEFINITION OF SIC 2824

SIC 2824 SYNTHETIC ORGANIC FIBERS, EXCEPT CELLULOSIC

Establishments primarily engaged in manufacturing synthetic organic fibers, except cellulosic (including those of regenerated proteins, and of polymers or copolymers of such components as vinyl chloride, vinylidene chloride, linear esters, vinyl alcohols, acrylonitrile, ethylenes, amides, and related polymeric materials) in the form of monofilament, yarn, staple or tow suitable for further manufacturing on spindles, looms, knitting machines or other textile processing equipment. Establishments primarily engaged in manufacturing textile glass fibers are classified in Industry 3229.

Acrylic fibers
Acrylonitrile fibers
Anidex fibers
Casein fibers
Elastomeric fibers
Fibers, man-made: except cellulosic
Fluorocarbon fibers
Horsehair, artificial: nylon
Linear esters fibers
Modacrylic fibers
Nylon fibers and bristles
Olefin fibers
Organic fibers, synthetic: except cellulosic
Polyester fibers
Polyvinyl ester fibers
Polyvinylidene chloride fibers
Protein fibers
Saran fibers
Soybean fibers (man-made textile materials)
Vinyl fibers
Vinylidene chloride fibers
Yarn, organic man-made fiber except cellulosic
Zein fibers

Source: The 1972 Standard Industrial Classification Manual.

EXHIBIT D-5
DEFINITION OF SIC 3011

SIC 3011 TIRES AND INNER TUBES

Establishments primarily engaged in manufacturing pneumatic casings, inner tubes, and solid and cusion tires for all types of vehicles, airplanes, farm equipment, and children's vehicles; tiring; and camelback, and tire repair and retreading materials. Establishments primarily engaged in retreading tires are classified in Industry 7534.

Camelback for tire retreading
Inner tubes; airplane, automobile, bicycle, motorcycle, and tractor
Pneumatic casings (rubber tires)
Tire sundries and tire repair materials, rubber
Tires, cushion or solid rubber
Tiring, continuous lengths: rubber, with or without metal core

Source: 1972 Standard Industrial Classification Manual

EXHIBIT D-6
DEFINITION OF SIC 3021

SIC 3021 RUBBER AND PLASTICS FOOTWEAR

Establishments primarily engaged in manufacturing all rubber and plastics footwear, waterproof fabric upper footwear, and other fabric upper footwear having rubber or plastic soles vulcanized to the uppers. Establishments primarily engaged in manufacturing rubber, composition, and fiber heels, soles, soling strips, and related shoemaking and repairing materials are classified in Industry 3069; plastic soles and soling strips in Industry 3079.

Arctics, rubber or rubber soled fabric
Boots, plastics
Boots, rubber or rubber soled fabric
Canvas shoes, rubber soled
Footholds, rubber
Footwear, rubber or rubber soled fabric
Gaiters, rubber or rubber soled fabric
Galoshes, plastics
Galoshes, rubber or rubber soled fabric
Overshoes, plastics
Overshoes, rubber or rubber soled fabric
Pacs: rubber or rubber soled fabric
Sandals, rubber
Shoes, plastics soles molded to fabric uppers
Shoes, rubber or rubber soled fabric uppers
Shower sandals or slippers, rubber

Source: 1972 Standard Industrial Classification Manual

EXHIBIT D-7
DEFINITION OF THE RECLAIMED
RUBBER INDUSTRY SIC 3031

SIC 3031 RECLAIMED RUBBER

Establishments primarily engaged in reclaiming rubber from scrap rubber tires, tubes, and miscellaneous waste rubber articles by processes which result in devulcanized, depolymerized or regenerated replasticized products containing added ingredients. These products are sold for use as a raw material in the manufacture of rubber goods with or without admixture with crude rubber or synthetic rubber. Establishments primarily engaged in the assembly and wholesale sale of scrap rubber are classified in trade industries.

Reclaimed rubber (reworked by manufacturing processes)

Source: 1972 Standard Industrial Classification Manual

EXHIBIT D-8
DEFINITION OF THE RUBBER AND PLASTICS HOSE AND BELTING INDUSTRY, SIC 3041

SIC 3041 RUBBER AND PLASTICS HOSE AND BELTING

Establishments primarily engaged in manufacturing rubber and plastics hose and belting, including garden hose. Establishments primarily engaged in manufacturing rubber tubing are classified in Industry 3069; plastic tubing in Industry 3079; and flexible metallic hose in Industry 3599.

Air brake and air line hose, rubber or rubberized fabric
Automobile hose, plastics
Automobile hose, rubber
Belting: conveyor, elevator, transmission, etc. - rubber
Fire hose, rubber
Garden hose, plastics
Garden hose, rubber
Heater hose, plastics
Heater hose, rubber
Hose: cotton fabric, rubber lined
Pneumatic hose: air brake, air line, etc. - rubber or rubberized fabric
Vacuum cleaner hose, plastic
Vacuum cleaner hose, rubber
V-belts, rubber or plastic

Source: 1972 Standard Industrial Classification Manual

EXHIBIT D-9(1)
DEFINITION OF SIC 3069

SIC 3069 FABRICATED RUBBER PRODUCTS, NOT ELSEWHERE CLASSIFIED

Establishments primarily engaged in manufacturing industrial and mechanical rubber goods, rubberized fabrics and vulcanized rubber clothing and miscellaneous rubber specialties and sundries. Establishments primarily engaged in rebuilding and retreading tires are classified in Industry 7534; and gaskets and packing in Industry 3293.

Acid bottles, rubber
Air supported rubber structures
Aprons, vulcanized rubber and rubberized fabric: mitse
Bags, rubber or rubberized fabric
Balloons, advertising and toy: rubber
Balloons, metal foil laminated with rubber
Balls, rubber: except baseballs, basketballs, footballs, golf and tennis
Bath sprays, rubber
Bathing caps and suits, rubber
Battery boxes, jars, and parts: hard rubber
Bibs, vulcanized rubber and rubberized fabric: mitse
Bottles, rubber
Boxes, hard rubber
Brake lining, rubber
Brushes, rubber
Bulbs for medicine droppers, syringes, atomizers, sprays: rubber
Bushings, rubber
Capes, vulcanized rubber and rubberized fabric: mitse
Caps, rubber
Castings, rubber
Chlorinated rubbers, natural
Cloaks, vulcanized rubber and rubberized fabric: mitse
Clothing, vulcanized rubber and rubberized fabric: mitse
Combs, hard rubber
Culture cups, rubber
Cyclo rubbers, natural
Dress shields, vulcanized rubber and rubberized fabric: mitse
Druggists' sundries, rubber
Erasers: rubber or rubber and abrasive combined
Fabrics, rubberized
Finger cots, rubber
Flooring, rubber: tile or sheet
Foam rubber
Fountain syringes, rubber
Friction tape, rubber
Fuel tanks, collapsible: rubberized fabric
Funnels, rubber
Gloves: surgeons', electricians', household, etc. -- rubber
Grips and handles, rubber
Grommets, rubber
Gutta percha compounds
Hair curlers, rubber
Hairpins, rubber
Handles, rubber
Hard rubber products
Hard surface floor coverings: rubber
Heels, boot and shoe: rubber, composition, and fiber
Jar rings, rubber
Laboratory sundries: cases, covers, funnels, cups, bottles, etc. -- rubber
Latex, foamed
Life jackets: inflatable, rubberized fabric

Life rafts, rubber
Liner strips, rubber
Mallets, rubber
Mats and matting - bath, door, etc. - rubber
Mattress protectors, rubber
Mattresses, pneumatic - fabric coated with rubber
Medical sundries, rubber
Mittens, rubber
Molded rubber products
Mouthpieces for pipes, cigarette holders, etc. - rubber
Nipples, rubber
Orthopedic sundries, molded rubber
Pacifiers, rubber
Pads, kneeling - rubber
Pants, baby - vulcanized rubber and rubberized fabric - mitse
Pillows, sponge rubber
Pipestems and bits, tobacco - hard rubber
Platens, except printers' - solid or covered rubber
Plumbers' rubber goods
Pontoons, rubber
Pump sleeves, rubber
Rods, hard rubber
Rolls, except printers' - solid or covered rubber
Rubber bands
Rubber covered motor mounting rings (rubber bonded)
Rubber heels, soles, and soling strips
Rug backing compounds, latex
Separators, battery - rubber
Sheeting, rubber or rubberized fabric
Sheets, hard rubber
Sleeves, pump - rubber
Soles, boot and shoe - rubber composition and fiber
Soling strips, boot and shoe - rubber, composition, and fiber
Spatulas, rubber
Sponge rubber and sponge rubber products
Stair treads, rubber
Stationers' sundries, rubber
Stoppers, rubber
Teething rings, rubber
Thermometer cases, rubber
Thread, rubber - except fabric covered
Tile, rubber
Top lift sheets, rubber
Top roll covering, for textile mill machinery - rubber
Toys, rubber
Trays, rubber
Tubing, rubber
Type, rubber
Urinals, rubber
Valves, hard rubber
Wainscoting, rubber
Washers, rubber
Water bottles, rubber
Weather strip, sponge rubber
Wet suits, rubber

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